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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,629	07/26/2004	Liqin Wang	149461XT (GEMS 0248 PUS)	4628
27256	7590	05/18/2006	EXAMINER	
ARTZ & ARTZ, P.C. 28333 TELEGRAPH RD. SUITE 250 SOUTHFIELD, MI 48034			ARTMAN, THOMAS R	
			ART UNIT	PAPER NUMBER
			2882	

DATE MAILED: 05/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/710,629		WANG ET AL.	
	Examiner		Art Unit	
	Thomas R. Artman		2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

The amendment filed March 13th, 2006, is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: “The height H may be determined using thermal modeling techniques known in the art.” (par.[0031]) As stated in the rejection made in the previous Office action, “Nowhere in the specification does Applicant provide sufficient disclosure or guidance for one of ordinary skill in the art to make the determination or calculate the...height...as a function of the thermal energy transfer between the anode and the bearings, or to make the determination or calculate the...height...as a function of the temperature relationship between bearings. Therefore, the examiner has concluded that the specification is not enabling for one of ordinary skill in the art to make the invention.” Since no method of determination was enabled by the specification as originally filed, then the above entry of a method by which the determinations can be made is not supported by the originally-filed disclosure and thus constitutes new matter.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding lines 7-9 of claim 1 and lines 10-11 of claim 16, the limitation of “the thermally conductive bearing encasement configured and expansion limited to prevent displacement of said focal spot of greater than a predetermined displacement.” There is insufficient guidance disclosed for one of ordinary skill to properly “configure” or “expansion limit” the bearing encasement and the thermal shield in order to reduce focal spot displacement less than a “predetermined amount”, because Applicants have not provided measurements nor criteria for determining what a “predetermined amount” is.

Claims 2-15 and 18 are rejected by virtue of their dependency.

Regarding claim 19, lines 12-14 recites the limitation of “the thermally conductive bearing encasement and thermal shield configured and expansion limited to prevent displacement of said focal spot of greater than approximately 700 μm .” There is insufficient guidance disclosed for one of ordinary skill to properly “configure” or “expansion limit” the

Art Unit: 2882

bearing encasement and the thermal shield in order to reduce focal spot displacement by no more than 700 μm . The supporting disclosure is in paragraph 0027. Only a statement that the above displacement is acceptable is made. No guidance is provided for correlating the behavior of the bearing encasement and the function of the thermal shield directly to focal spot displacement. Furthermore, no discussion on how that number was chosen or the significance thereof is disclosed.

Regarding claims 17 and 20, both claims recite additional functional language that specifies the heat shield is configured for maintaining temperature continuity between the bearings. The specification not only does not describe how the skilled artisan determines such parameters, but also does not even recognize the importance of this limitation. The concept is mentioned only about twice in the specification, and nowhere is any specific importance of temperature continuity between bearings specified or how it affects the independent claim requirements of preventing focal spot displacement.

Regarding claim 21, the limitations in lines 3-9 recite:

- a) “determining a maximum focal spot displacement associated with the target of the anode assembly,”
- b) “determining a desired elastic modulus of at least one control alloy expansion material for the thermally conductive bearing encasement in response to the maximum focal spot displacement,” and

Art Unit: 2882

c) “determining a desired thermal conductivity of said at least one control alloy expansion material...”

Nowhere in the specification has Applicant provided sufficient disclosure or guidance for one of ordinary skill in the art to make the above determinations. Regarding step a), methods are known in the art to measure displacement of a focal spot. However, the limitation requires that the maximum focal spot displacement is a “displacement associated with the target of the anode assembly.” As is known in the art, imperfections of other parts of the x-ray tube, such as the cathode assembly (filament or focusing cup deformation w/temperature, as well as electron beam instability, for example), also cause focal spot displacement. Applicant has not disclosed how the focal spot displacement caused by the target of the anode assembly has been isolated, therefore allowing the determination of “a maximum focal spot displacement associated with the target...”

Further, Applicant has not provided sufficient disclosure or guidance for making the determination of steps b) and c), specifically, being able to determine the preferred material properties of the alloy to be used for the bearing encasement based upon the result of step a). The relationship between bearing encasement expansion and focal spot displacement associated with the target is not provided. It cannot be assumed to be a simple linear relationship, since the relationship would be dependent upon the specific construction of the anode assembly, as well as the thermal expansion of the shaft and any other intermediate parts between the bearing encasement and the focal spot on the anode. Furthermore, all of the tables, charts and graphs in the specification and drawings merely tabulate material properties that are readily known from

Art Unit: 2882

materials handbooks and manufacturer specifications and, therefore, do not sufficiently illustrate the above method steps.

Claims 22 and 23 are rejected under this section by virtue of their dependency. The steps claimed are known to those skilled in the art; however, the steps are based upon the un-enabled steps of parent claim 21 and are thus not enabled by the specification.

Therefore, the examiner has concluded that the specification is not enabling for one of ordinary skill in the art to make and/or use the invention of claims 1-23.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Kuzniar (US 6,295,338 B1).

Regarding claim 1, Kuzniar discloses an anode assembly (Fig.3), including:

- a) a thermally conductive bearing encasement 100, 102 and 104 covering at least a portion of at least one bearing 64, 65,
- b) an anode 24 rotating on the at least one bearing and having a target 30 with an associated focal spot (not labeled, opposite cathode 23), where

Art Unit: 2882

c) the thermally conductive bearing encasement is expansion limited, which prevents displacement of the focal spot by a predetermined displacement (col.9, line 55 through col.10, line 3). Examiner note: since the specification does not provide any special definition or guidance or criticality with respect to determining how much a “predetermined displacement” is, therefore any displacement is reasonably a “predetermined displacement.”

With respect to claims 2-4, Kuzniar further discloses that the bearing encasement comprises a thermally conductive stem 102 made of an alloy, specifically of iron, nickel and cobalt (Kovar, col.9, line 55 through col.10, line 3).

With respect to claims 5-7, Kuzniar further discloses that the bearing encasement comprises a thermally conductive housing 104 made of an alloy, specifically of iron, nickel and cobalt (col.9, line 55 through col.10, line 3).

With respect to claims 8-10, Kuzniar further discloses a heat shield 216 (Fig.4) that prevents thermal energy transfer between the anode and the bearings and is sufficiently dimensioned in order to appropriately redirect heat flow from the bearings (col.12, line 45 through col.13, line 25).

With respect to claims 11 and 12, Kuzniar further discloses that the heat shield has at least one hole 221 that is radially oriented for the transfer of thermal energy between the anode and the bearing.

Art Unit: 2882

With respect to claims 13 and 14, Kuzniar further discloses that the thermally conductive bearing encasement and the heat shield maintain operating temperatures of the at least one bearing to approximately 400 degrees Centigrade (col.2, lines 37-49).

With respect to claim 15, Kuzniar further discloses that the thermally conductive bearing encasement prevents displacement of the focal spot in any direction (col.9, line 55 through col.10, line 3).

Claims 16-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Lu (US 6,603,834 B1).

Regarding claim 16, Lu discloses an x-ray source (Fig.5), including:

- a) a cathode 70 emitting electrons 72,
- b) a thermally conductive bearing encasement 84 comprising at least one alloy material (thermally-conductive metal) and covering at least one bearing 86,
- c) an anode 64 rotating on and around the at least one bearing and having a target 62 whereupon the electrons impinge to generate x-rays 74 at a focal spot, and
- d) a thermal shield 90 residing axially between the thermally conductive bearing encasement and the anode along an axis of rotation, where
- e) the bearing encasement and the thermal shield are configured and expansion limited, which prevents displacement of the focal spot more than a predetermined displacement (col.1, lines 56-67; col.5, lines 16-21). Examiner note: since the specification does not provide any

Art Unit: 2882

special definition or criticality with respect to determining how much a “predetermined displacement” is, therefore any displacement is reasonably a “predetermined displacement.”

Regarding claim 19, Lu discloses:

- a) an x-ray source (Fig.5), including:
- b) a cathode 70 emitting electrons 72,
- c) a thermally conductive bearing encasement 84 comprising at least one alloy material (thermally-conductive metal) and covering at least one bearing 86,
- d) an anode 64 rotating on and around the at least one bearing and having a target 62 whereupon the electrons impinge to generate x-rays 74 at a focal spot, and
- e) a thermal shield 90 residing axially between the thermally conductive bearing encasement and the anode along an axis of rotation, where
- f) the bearing encasement and the thermal shield are configured and expansion limited, which prevents displacement of the focal spot (col.1, lines 56-67; col.5, lines 16-21), and further where
- g) the focal spot displacement is necessarily less than 700 μm .

With respect to claims 17, 18 and 20, Lu further teaches that the heat shield has a hole (at the top) for the transfer of thermal energy, and further that the heat shield height is sufficiently dimensioned in order to appropriately redirect heat flow from the bearings (col.5, lines 16-21).

Allowable Subject Matter

The indicated allowability of claims 21-23 has been withdrawn in view of the newly discovered lack of enablement under 35 USC § 112 ¶ 1.

Response to Amendment

The 35 USC § 102(b) rejections of claims 16-20 as being anticipated by Kuzniar have been withdrawn in view of the amendments. However, the claims stand rejected over new grounds of rejection that were necessitated by the amendments.

Response to Arguments

Applicant's arguments filed March 13th, 2006, have been fully considered but they are not persuasive. Applicants argue that Kuzniar does not recognize the stated problem, thus Kuzniar does not disclose that the bearing encasement is configured and expansion limited to prevent displacement of the focal spot greater than a predetermined displacement, as required by lines 7-9 of claim 1. Further, Applicants argue that the disclosure of Kuzniar is not clear regarding whether or not the focal spot is sensitive to displacement caused by expansion of the bearing encasement, as required by lines 5-6 of claim 1, as amended. Finally, Applicants argue that the hole in the heat shield of Kuzniar is not "radially oriented" as required by amended claim 12. The examiner respectfully disagrees.

First, the examiner agrees that Kuzniar does not specifically recognize that focal spot displacement is a function of thermal expansion of the bearing encasement. However, the limitation in lines 7-9 of claim 1 does not require such a recognition. The limitation is quite broad, merely requiring that the bearing encasement is “configured” and “expansion limited” to perform an inherent function. If the bearing encasement meets the “configured” and “expansion limited” requirements of the claim, then it inherently will prevent displacement of the focal spot, since that’s one less component of the anode assembly that will expand.

Kuzniar clearly meets the structural limitations. The bearing encasement is “configured” since it is fixed to the outer housing at supports 86, and the encasement is further “expansion limited” since one portion is made of a ceramic and another portion is made of Kovar. Further still, Kuzniar touts the thermal cooling arrangements, which also qualifies as being “configured” as well as “expansion limited”, since cooling will reduce the temperature of the bearing encasements, and thus, reduce the thermal expansion of that component. With the materials, the support structure and the cooling system, it is clear that the bearing encasement of Kuzniar will essentially not move as the temperature rises and thus will not contribute to the displacement of the focal spot. Therefore, the requirements of the claim limitation have been met.

This leads into the second point, regarding the amended limitation to require that the focal spot is sensitive to expansion of the bearing encasement. If Kuzniar’s device was not “configured” or “expansion limited”, then the bearing encasement would expand, providing room for the bearings (and thus the shaft) to displace, thus causing displacement of the focal spot. However, since the bearing encasement of Kuzniar is made of expansion limiting

Art Unit: 2882

materials, and since it is “configured” through the supports and cooling systems described above, then Kuzniar has inherently solved the problem.

As a final note on this matter, for a sufficient anticipation rejection, the stated problem does not have to be recognized by the prior art insofar as the structural limitations are met. In this case, the structural limitations are met. Further, according to MPEP § 2112, section II, upon discussing anticipation of an unrecognized inherent feature:

“There is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of invention, but only that the subject matter is in fact inherent in the prior art reference. *Schering Corp. v. Geneva Pharm. Inc.*, 339 F.3d 1373, 1377, 67 USPQ2d 1664, 1668 (Fed. Cir. 2003).”

Kuzniar does not specifically recognize that the “configured” and “expansion limited” bearing encasement helps to prevent focal spot displacement. This does not change the fact, however, that the bearing encasement of Kuzniar is “configured” and “expansion limited” as explained above, which is all that is required for anticipation under 35 USC § 102.

Finally, regarding the amendment to claim 12, the term “radially oriented” does not provide any structural significance. The claim doesn’t even provide a reference with which to “orient” the hole with the rest of the system. Since the hole in the heat shield of Kuzniar is coaxial with the longitudinal axis of the system (which is also the longitudinal axis of the rotating anode shaft and the heat shield), then it is “radially oriented” since the radius of the hole is “oriented” with the radii of other portions of the system.

Art Unit: 2882

Therefore, Applicants' arguments are not persuasive, and the 35 USC 102(b) rejections of claims 1-15 stand.

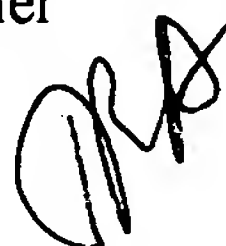
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

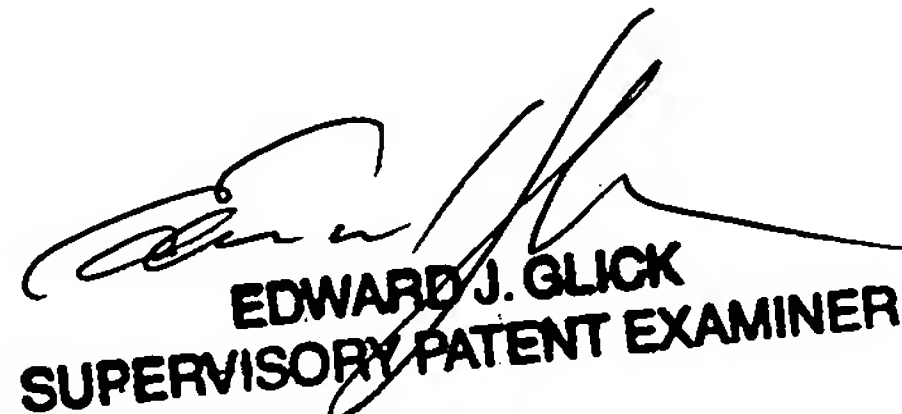
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thomas R. Artman
Patent Examiner



5/14/06



EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER